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Timing of primary molt in first-year Golden-Plovers and some evolutionary implications.—Connors (Auk 100:607–620, 1983) presents a strong case for elevating the two subspecies of Lesser (American) Golden-Plovers (*Pluvialis dominica dominica* and *P. d. fulva*) to full species *P. dominica* and *P. fulva*. Based upon a discriminant function analysis involving various measurements and plumage characteristics, Connors found that phenotypically intermediate specimens were no more frequent in areas of sympatry than in areas of allopatry. He proposed that hybrids are at a selective disadvantage relative to the conditions imposed by the very different migration routes and wintering areas of the two taxa (*dominica* winters on grasslands of South America; *fulva* on islands and atolls of the Pacific); thus, “the requirements of migration and winter range drive the process of speciation.” Here, I report observations on the timing of primary molt in first-year golden-plovers that reveal a major difference between *dominica* and *fulva*. This adds yet another distinction between the two forms.

Johnson and Johnson (Condor 85:406–419, 1983) analyzed molts in *fulva* using specimens from Oahu, Hawaii (N = 70 banded and 83 collected) and Enewetak Atoll, Marshall Islands (N = 84 collected). Specific findings relevant to this paper are: (1) The juvenal primaries are not molted during the first winter; consequently these feathers become faded and worn by spring. (2) On Oahu, some first-year birds migrate (using the worn juvenal primaries), while others remain on the wintering grounds and “over-summer.” Many (possibly all) young birds over-summer at Enewetak. Over-summering individuals begin molting juvenal primaries during the summer; migratory first-year birds defer this molt until they return to the wintering grounds in the fall, having made two southward and one northward migration with the same primaries. (3) The cloacal bursa remains large enough to be a definitive criterion of age in almost every individual through the first spring and into the second summer of life. Most individuals finally lose the bursa at about one year of age. (4) Adults molt their primaries on the wintering grounds; the new feathers appear dark and fresh in the spring and contrast strikingly with the worn juvenal primaries of first-year birds at that season.

Migrating *dominica* are relatively common near Moorhead, Minnesota, in the spring, and I collected 16 specimens during the periods 13–15 May 1971 and 4–14 May 1974. Six of these contained cloacal bursae that were identical in appearance and weight (ranging from 18 to 124 mg) to the springtime bursae of first-year *fulva*. Assuming that the chronology of bursa development is the same in both taxa, the six *dominica* with bursae were first-year birds. All *dominica* specimens, including those with bursae, had fresh, dark primaries like those of adult *fulva* in the spring. If the timing of primary molt in first-year *dominica* is similar to that of *fulva*, I should have found worn primaries in those birds with bursae. Though the sample is limited, it is reasonable to conclude that juvenal *dominica* molt their primaries during the first winter of life.

Additional study might reveal at least some variation from the foregoing pattern as it is not uncommon for primary molt schedules in first-year shorebirds to vary from one region of the winter range to another (Prater et al., Guide to the Identification and Ageing of Holarctic Waders, British Trust for Ornithology, Field Guide 17, 1977; Myers et al., Going to Extremes: Why Do Sanderlings Migrate to the Neotropics? Ornithol. Monogr., No. 36, 1985). However, Connors' (1983) findings further suggest that primary molt in the first winter is the typical pattern for *dominica*. He classified primary wear and appearance among birds collected in spring migration or on breeding grounds as follows: many *fulva* (about 30%) with moderate to heavy wear, the remainder with light wear to fresh; almost all *dominica* (about 95%) with light wear to fresh, a few with moderate wear, none with heavy

wear. Based on the assumption that first-year birds have worn primaries (valid in *fulva*, Johnson and Johnson 1983), Connors interpreted his results as indicating that "many more *fulva* than *dominica* return to breeding grounds during their first spring." Another possibility is that *dominica* molts the juvenal primaries earlier than *fulva*, and that many of the *dominica* specimens examined by Connors were first-year birds. The latter interpretation is consistent with the findings presented here and with observations on the winter range. Wetmore (Observations on the Birds of Argentina, Paraguay, Uruguay, and Chile, U.S. Natl. Mus. Bull. No. 133, 1926) noted only a few *dominica* over-summering in Argentina and implied that such scattered individuals were unusual. I have found no subsequent reports contradicting Wetmore's findings, and no records suggesting that *dominica* characteristically over-summerers in areas between the winter and summer ranges. Thus, I concur with Stresemann and Stresemann (Die Mauser der Vögel, J. Ornithol. 107, Suppl., 1966) that first-year *dominica* typically return to the breeding grounds.

One can only speculate as to the evolutionary basis of the difference between *fulva* and *dominica* in the timing of juvenal primary molt. One possibility is that resource availability differed significantly on the respective wintering grounds of these taxa during the speciation process. Until relatively recent times, most of the insular Pacific was forested and low upland cover suited to foraging by plovers was lacking. Under these conditions, wintering *fulva* must have been concentrated on intertidal and occasional marshland habitats, which perhaps offer less food than upland grasslands. Thus, *fulva* may have evolved in an environment with limited capacity to sustain the energy costs of molting whereas the pattern may have been the reverse for *dominica*. In *fulva*, resource availability would be a particular problem for juveniles arriving for the first time on the wintering grounds (juveniles arrive about six weeks later in fall migration than adults, Johnson and Johnson 1983) as they would be confronted with the difficulty of establishing themselves on a limited range already occupied by older birds. Survival in the first winter may require that birds defer wing molt so as to commit their energy resources to matters of more immediate importance. That the timing of primary molt in first-year birds may be related fundamentally to winter resources is implicit in studies of the Sanderling (*Calidris alba*) by Myers et al. (1985). They found that first-year birds wintering in Chile replaced their primaries while birds wintering in California did not. While emphasizing the need for more research, the authors concluded that "resource conditions for Sanderling appear to be more favorable on Chile's northern coast than in California." If this overall scenario is accurate, hybrid individuals on the winter range of *fulva* that attempted to molt might lack critical resources and could be less likely to survive. The fate of hybrids on the winter range of *dominica* is less clear. From the perspective of resource availability, such birds might be more likely to survive. The timing of their molt, however, may be out of synchrony with that of *dominica*, and this and/or other features peculiar to hybrids might result eventually in a selective disadvantage.

Large areas of Hawaii have undergone development compatible with the requirements of wintering plovers (i.e., land converted to lawns, pastures, agricultural fields, airports, etc.). Most of these changes are relatively recent and seem beneficial as birds can now forage on previously unavailable uplands rich in insect prey. Johnson and Johnson (1983) found among first-year birds wintering in Hawaii that some became fat and acquired alternate body feathering, while others remained lean and drab. The fatter, more brightly colored birds migrated; the others over-summered.

Much of the insular Central and South Pacific appears to offer less food and space suitable for plovers than comparable areas in Hawaii. Such restrictions combined with long migratory flights and competition with older, more experienced birds (our studies in Hawaii show the latter to be remarkably site-faithful and potentially long-lived) could result in stressful wintering conditions for most young birds. Insufficient winter resources would preclude

primary molt, gonadal maturation, premigratory fattening, and migration, thus culminating in over-summering behavior. As the molting of juvenal primaries is not prerequisite to spring migration (at least not at the northern end of the winter range in Hawaii), lack of molt cannot be coupled with over-summering in a cause-effect relationship. Rather, both phenomena appear to be adaptations that enhance survival in the first winter. I suggest that over-summering behavior represents the ancestral condition for *fulva* throughout the Pacific, that it is presently the norm on ranges south of Hawaii, and that the variability encountered in Hawaii reflects a recent improvement in the food supply.

There are as yet no data to support my proposed scenarios of an easier life on the pampas as compared to the Pacific, and on improved habitats in Hawaii relative to other regions of the Pacific. The critical factor is the relative availability of resources on a per capita basis. Comparative studies of golden-plovers on their Pacific and South American wintering grounds offer a potentially fruitful opportunity to evaluate Connors' (1983) hypothesis that conditions on the winter range are fundamental to speciation, and to consider further the questions that I have raised here. Information is needed concerning densities of wintering birds, availability and dependability of food supplies, competition for food, foraging success, body weights, and time-activity budgets; with particular attention given to the biology of first-winter individuals.

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Wing molt by a nesting Pied-billed Grebe.—Although there are exceptions, molting and breeding of birds typically occur at separate times during the annual cycle. These events are thought to be energetically incompatible in most species (Payne, pp. 103–155 in *Avian Biology*, Vol. 2, D. S. Farner and J. R. King, eds., Academic Press, New York, New York, 1972). According to Palmer (*Handbook of North American Birds*, Vol. 1, Yale Univ. Press, New Haven, Connecticut, 1962), the postnuptial molt of Pied-billed Grebes (*Podilymbus podiceps*) occurs in autumn; however, there is much individual variation in the timing and duration of this molt. Flight feathers are all shed and replaced before any apparent loss of other feathers. Prior to this note, molting by nesting Pied-billed Grebes has not been reported.

After finding shed flight feathers on the surfaces of several active Pied-billed Grebe nests on Rush Lake, Winnebago Co., Wisconsin (43°56'N, 88°48'W), we suspected that at least some individuals of this species were molting while nesting. Our suspicions were confirmed on 7 July 1980. We placed an automatic nest-trap (Otto, *N. Am. Bird Bander*, 8:52–53, 1983) on an active Pied-billed Grebe nest on which we found several shed flight feathers. The nest contained a six-egg clutch that had been completed on approximately 25 June. This was a rather late-season nest for Pied-billed Grebes on Rush Lake (Otto, M.S. thesis, Univ. Wisconsin–Oshkosh, Oshkosh, Wisconsin, 1983). We captured an adult Pied-billed Grebe that was undergoing wing molt. All old primaries and secondaries had been shed, and there was nearly 1 cm new growth of the most distal primary of each wing. We found